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A high mobility two-dimensional electron gas at the $\text{CaZrO}_3/\text{SrTiO}_3$ heterointerface

Y.Z. Chen^{*}, F. Trier, D. V. Christensen, S. Linderoth, and Nini Pryds

Department of Energy Conversion and Storage, Technical University of Denmark, Roskilde,
Denmark

^{*} yuc@dtu.dk

The discovery of two-dimensional electron gases (2DEGs) in SrTiO_3 -based heterostructures provides new opportunities for nanoelectronics^{1,2}. Herein, we create a new type of oxide 2DEG by the epitaxial-strain-induced polarization at an otherwise nonpolar perovskite-type interface of $\text{CaZrO}_3/\text{SrTiO}_3$.^{3,4} Remarkably, this heterointerface is atomically sharp, and exhibits a high electron mobility exceeding $60,000 \text{ cm}^2\text{V}^{-1}\text{s}^{-1}$ at low temperatures. The 2DEG carrier density exhibits a critical dependence on the film thickness, in good agreement with the polarization induced 2DEG scheme.

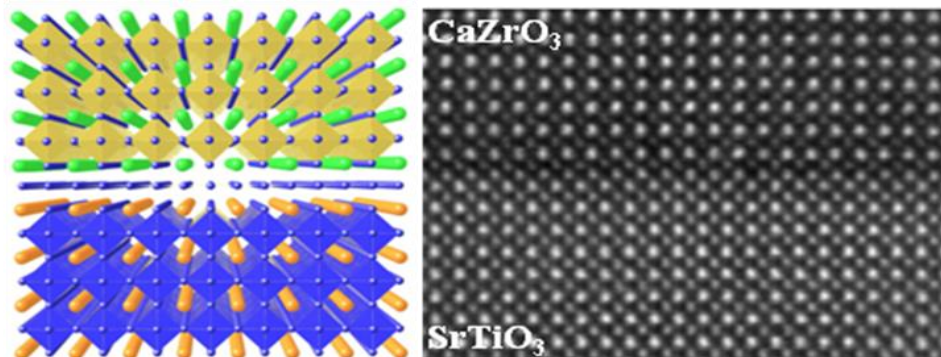


Figure 1. Atomically-flat epitaxially grown perovskite-type interface of $\text{CaZrO}_3/\text{SrTiO}_3$ determined by STEM-EELS.

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